

Total No. of Questions—12]

[Total No. of Printed Pages—4+2

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**[4757]-115**

**S.E. (Mechanical, Mech. Sand., Automobile, Production,  
Prod. Sand.) (Second Semester) EXAMINATION, 2015  
ELECTRICAL TECHNOLOGY  
(2008 PATTERN)**

**Time : Three Hours****Maximum Marks : 100**

**N.B. :—** (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 from Section I and Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12 from Section II.

(ii) Answers to the two Sections should be written in separate answer-book.

(iii) Figures to the right indicate full marks.

(iv) Neat diagrams must be drawn wherever necessary.

(v) Use of non-programmable scientific calculator is allowed.

(vi) Assume suitable data wherever necessary and state the same clearly.

**SECTION I**

1. (a) Discuss one wattmeter method for measurement of reactive power in a three-phase balanced load with the help of connection diagram and phasor diagram.

[6]

P.T.O.

- (b) State advantages of good power factor in electrical systems. Hence mention methods of improving power factor. [6]
- (c) A 3-phase motor load has a power factor of 0.397 lagging. Two wattmeters connected to measure power provide the total input as 30 kW. Find the reading on each wattmeter. [6]

*Or*

2. (a) Explain single-phase energy measurement using CT and PT with the help of connection diagram. [6]
- (b) Explain in brief the requirements of good lighting scheme. State any *two* examples of special purpose lighting. [6]
- (c) Two wattmeters are used to measure power in a 3-phase balanced load. The wattmeter readings are 8.2 kW and 7.5 kW respectively. Calculate :
- (i) Total power
- (ii) Power factor
- (iii) Total reactive power. [6]
3. (a) Discuss the typical layout of distribution transformer substation with the help of single line diagram. [8]
- (b) Derive an expression for torque developed in a three-phase induction motor under running conditions. Hence obtain the condition for maximum torque. [8]

*Or*

4. (a) Discuss three-phase transformer connections with the help of suitable diagrams. State possible applications of transformers based on these connections. [8]
- (b) The power input to a 500 V, 50 Hz, 6-pole, 3-phase induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and the friction and windage losses are 2 kW. Calculate :
- (i) Slip
  - (ii) Rotor copper loss
  - (iii) Shaft power
  - (iv) Efficiency of motor. [8]
5. (a) Distinguish between salient pole and non-salient pole type of synchronous generators. Write specifications of these generators. [8]
- (b) Why is a single-phase induction motor not self-starting ? Explain the working principle and construction of a split phase induction motor. [8]

*Or*

6. (a) Explain the construction and working of a shaded pole induction motor with the help of neat diagrams. Mention its typical specifications. [8]
- (b) Find the synchronous impedance and reactance of a single-phase alternator in which a given field current produces an armature current of 200 A on short circuit and a generated e.m.f. of 50 V on open circuit. The armature resistance is 0.1 ohm. To what induced voltage must the alternator be excited if it is to deliver a load of 100 A at a power factor of 0.8 lagging with a terminal voltage of 200 V. [8]

## SECTION II

7. (a) What is a servomotor ? Explain construction and working of D.C. servomotor. Write its any *four* applications. [8]
- (b) State and explain any *two* methods for controlling the speed of a D.C. shunt motor. Also mention merits and demerits of these methods. [8]

*Or*

8. (a) Explain construction and working of universal motor. State its any *two* applications. [8]
- (b) A D.C. series motor runs at 800 rpm with a line current of 100 A from 230 V mains. Its armature circuit resistance is  $0.15\ \Omega$  and field resistance is  $0.1\ \Omega$ . Find the speed at which the motor runs at a line current of 25 A, assuming the flux at this current is 45% of flux at 100 A. [8]
9. (a) State methods to turn ON SCR. Draw and explain V-I characteristics of SCR. [8]
- (b) Explain construction and working of enhancement type MOSFET with the help of suitable diagrams. Draw its output characteristics. [8]

*Or*

10. (a) Draw and explain V-I characteristics of DIAC and TRIAC. [8]
- (b) Explain construction and working of GTO. Draw its characteristic curve and hence state its any *two* applications. [8]

11. (a) Describe the various types of chopper configurations in brief with the help of appropriate diagrams. [8]
- (b) State and explain factors for selection of electrical motors based on various load characteristics in industrial applications. Quote any *five* applications and state the suitable type of motor selected for these. [10]

*Or*

12. (a) Explain V/f control of three-phase induction motors. State *two* applications employing this method of control. [8]
- (b) What is a drive ? Discuss features of individual and group drives. Elaborate advantages of electrical drives. [10]